

## COMMENTS ON LESQUERELLA HITCHCOCKII

James L. Reveal<sup>1</sup>

In 1966 Barneby described a new subspecies of *Lesquerella hitchcockii* from bare white shale knolls southeast of Cannonville in Kane County, Utah. In 1967 I had an opportunity to recollect his ssp. *tumulosa* and compare it with my previous impressions of ssp. *confluens* of central Nevada and ssp. *rubicundula* of the upper Sevier River drainage of Garfield and Piute counties, Utah. In 1966 I had seen a few plants of ssp. *hitchcockii* on the Charleston Mountains, but during the summer of 1968 it was possible to investigate this taxon more thoroughly on both the Charleston and Sheep ranges of Clark County, Nevada. These various field observations are now summarized and the taxonomy of the species complex reviewed.

*Lesquerella hitchcockii* was described by Munz (1929) from a small collection obtained by Edmund C. Jaeger and C. Leo Hitchcock in 1927. In 1941, Rollins proposed *L. rubicundula* from central Utah, and noted its clear relationship with *L. hitchcockii*. Maguire and Holmgren (1951) summarized the species complex and proposed that Rollins' species be reduced to the subspecific rank. At the same time, they called attention to a third form from the Quinn Canyon Range of Nye County, Nevada, which they named ssp. *confluens*. This new subspecies was somewhat intermediate morphologically between the ssp. *hitchcockii* and *rubicundula*, but more so geographically, and their name was designed to show this position. When Barneby added ssp. *tumulosa* to the complex, he so further expanded the definition of the species, as represented by the type of *L. hitchcockii*, that the entire taxon took on a rather heterogeneous nature. This is rather clearly seen in the life-forms of the various isolated populations. The plants of ssp. *hitchcockii* are small with few, short, closely branched caudices with only a few flowering crowns. The caudices of ssp. *confluens* are numerous and long with the several branches often rhizomatous. Unlike the typical subspecies, ssp. *confluens* forms large mats which tumble at will over the loose gravelly boulders and talus slopes on the upper ridges of the Quinn Canyon Range. The life-form of ssp. *rubicundula* is somewhat similar to that of ssp. *confluens* except the branches of the caudices are greatly reduced to only a few in number, and the elongated, often rhizomatous branches do not form mats at all. The ssp. *tumulosa* differs from all of these taxa in that it is densely compacted into a small rounded cushion with several hundred crowded flowering crowns.

Other morphological features shared by these subspecies are less striking and the differences between the various populations becomes somewhat statistical (Maguire & Holmgren, 1951). However,

<sup>1</sup>Department of Botany, University of Maryland, College Park, Maryland 20742 and U.S. National Herbarium, Smithsonian Institution, Washington, D.C. 20560.

differences can be seen in the leaf characteristics, size of the siliques, and the length of the styles, although in all cases the differences are slight. In general it may be stated that the flowers of *Lesquerella* are essentially similar throughout the range of the genus in the West and are of limited value as a diagnostic characteristic. To a much lesser degree, however, are the siliques which have considerable diagnostic importance, but seeming only in separating species groups; and, to some degree, in separating *Lesquerella* from the related genus, *Physaria* (Mulligan, 1968). Consequently, in this genus, it seems likely that one should concentrate on the numerous vegetative features of the plants in arriving at taxonomic entities rather than the flora characters.

With this in mind and considering the geographical isolation of each entity and the likelihood of no possible gene exchange (see Ehrlich & Raven, 1969), it seems that the proper taxonomic rank for each of the above subspecies should be at a higher level.

#### Key to the Species

1. Plants open and spreading, not at all compact or cushion-like.
  2. Rosettes 2-20 per plant; caudices composed of few slender,  $\pm$ decumbent, branches; leaves 5-12 mm long.
    3. Leaves 2-4 mm wide, spatulate to broadly oblanceolate, tapering abruptly to a distinct petiole; styles 3-4.5 mm long; Charleston and Sheep ranges, Clark Co., Nevada.
      1. *L. hitchcockii*
    3. Leaves 1-2 mm wide, linear to linear-oblanceolate, tapering gradually into a scarcely distinct petiole; styles 1.5-3.5 mm long; Piute and Garfield cos., Utah.
      3. *L. rubicundula*
  2. Rosettes several hundred; caudices composed on numerous elongated, spreading, branches forming large mats; leaves 10-24 mm long, 1-3 mm wide, oblanceolate to elliptic, tapering to a short, but distinct, petiole; styles 4-6 mm long; Quinn Canyon Range, Nye Co., Nevada.
    2. *L. confluens*
1. Plants densely caespitose and cushion-like with several hundred flowering rosettes; caudices short and compacted, buried in the mass of decomposed vegetation and covered with numerous persistent leaf-bases; leaves linear, 3-10 mm long, 0.7-1 mm wide, tapering gradually into a scarcely distinct petiole; styles 1-2 mm long; north-central Kane Co., Utah.
  4. *L. tumulosa*

1. *Lesquerella hitchcockii* Munz, Bull. Torrey Bot. Club 56: 163, 1929. Type: High exposed ridges at 10500 ft elev, Charleston Mts, Clark Co., Nevada, 1 Sep 1927. *Jaeger & Hitchcock s.n.* Holotype, POM! Distribution: Charleston Mountains and the Sheep Range, Clark Co., Nevada, from 7500 to 11000 ft elev. Flowering from June to September.

As now outlined, *Lesquerella hitchcockii* is restricted to two high mountain ranges in southern Nevada, the Charleston (or Spring) Mountains and the adjacent Sheep Range. I have seen this species on both ranges, but on the Charleston, it is always at a higher elevation than it is on the Sheep Range. In spite of repeated efforts on the part of Janice C. Beatley, and to a lesser degree, efforts on my own part, this species has not been discovered on the high mountain ranges north of the Charllestons (Beatley, 1969). Thus, a distinct geographical gap exists between *L. hitchcockii* and the next species.

2. *Lesquerella confluens* (Maguire & Holmgren) Reveal, stat. & comb. nov., based on *L. hitchcockii* ssp. *confluens* Maguire & Holmgren, Madroño 11: 174. 1951. Type: Loose gravelly soil on a ridge N of Cherry Creek Pass, Quinn Canyon Range, at 7000 ft elev, Nye Co., Nevada, 20 Jun 1945, *Maguire & Holmgren 25534*. Lectotype, NY! Isotype, UTC! Distribution: Upper ridges of the Quinn Canyon Range, Nye Co., Nevada, from 7000 to 10000 ft elev. Flowering from June to August.

*Lesquerella confluens* is proposed as a new species based on its distinctive vegetative features and unique life-form. So far as known, it is restricted to the Quinn Canyon Range. When I saw this species in 1965, I felt at the time it was worthy of specific recognition. As Noel H. Holmgren and I were searching as many of the high mountain ranges as possible for *Primula nevadensis* (Holmgren, 1967), and we never discovered *L. confluens* anywhere else, I must conclude that it is likely restricted to this single range. How widely distributed the species is on the range is not known. Holmgren and I obtained our specimens a short distance to the northeast of the type location. However, when we were on the range in 1968 some distance south of Cherry Creek Pass, we failed to find the species although we did not climb above 8000 feet in elevation. It is possible that *L. confluens* may be found elsewhere. *Primula nevadensis* occurs both on the Quinn Canyon Range and the Snake Range, and Holmgren and I discovered *Tanacetum diversifolium* D. C. Eat. from the Quinns in 1968, a taxon previously known only from the Wasatch Mountains and the Deep Creek Mountains in northern Utah. However, also in spite of repeated searches, *Lewisia maguirei* Holmgren (1954) is known only from the Quinn Canyon Range.

3. *Lesquerella rubicundula* Rollins, Contr. Dudley Herb. 3: 178. 1941. *L. hitchcockii* ssp. *rubicundula* (Rollins) Maguire & Holmgren, Madroño 11: 175. 1951. Type: Red Canyon, Powell [now Dixie] National Forest, Garfield Co., Utah, 6 Jul 1912, *Eggleston 8198*. Holotype, US! Distribution: Red clay and gravelly places in Garfield and Piute cos., Utah, from 6700 to 7500 ft elev. Flowering from May to July.

Of all the taxa treated in this paper, this one is best known. It is commonly collected and represents one of the more frequently seen of the several Red Canyon endemics (Reveal, 1970). Also, it is perhaps the closest form to typical *Lesquerella hitchcockii* as re-

ported by Rollins (1941), Maguire and Holmgren (1951), and Barneby (1966). However, as noted by all of these authors, it differs in several vegetative features and essentially so in life-form, although in this regard the differences are less striking than those exhibited by *L. confluens* and *L. tumulosa*. In the several local populations that I have seen on and off since 1964, the degree of elongation of the caudices seems to depend to some extent on the pitch of the slope as noted by Barneby (1966). However, this does not always appear to be the case. On the flat ridges south of Red Canyon, I saw this species growing with *Cryptantha ochroleuca* Higgins (1968) and it had elongated caudices much in the same fashion as I saw on the plants on the slopes below the ridge. Unlike *L. hitchcockii*, the leaves of *L. rubicundula* are very narrow and lack a distinct petiole. The styles are shorter on the whole, although this feature is not paramount. The range of *L. rubicundula* is restricted to a small area around the Bryce Canyon area and northward in the Sevier River drainage to the Marysvale area, but to the north it is rare. To my knowledge, the species has not been found west of the Tushar Mountains.

4. *Lesquerella tumulosa* (Barneby) Reveal, stat. & comb. nov., based on *L. hitchcockii* ssp. *tumulosa* Barneby, Leaflet West. Bot. 10: 313. 1966. Type: Bare white shale knolls 6.5 mi SE of Cannonville, Kane Co., Utah, Barneby 14424. Holotype, NY! Isotypes, BRY, CAS, GH, UC, US, UTC! Distribution: White shale knolls near Kodachrome Flat, southeast of Cannonville in Kane Co., Utah, at ca 5700 ft elev. Flowering from April to June.

This species is the most depauperate of the various taxa treated in this paper, and it is the only member of the group that occurs in a decidedly desert environment. As all of the remaining taxa are montane plants, found at elevations above 6700 feet, *Lesquerella tumulosa* is the really odd member of the species complex. Barneby (1966), pointed out that this species is clearly related to *L. rubicundula*, but the two are so totally different in the field, that without careful study, this relationship could go undetected. The narrow leaves and the similarly shaped silique allies the two species, but in the genus as a whole, one would likely associate *L. tumulosa* more with the compacted cushion species such as *L. nanum* S. Wats., *L. condensata* A. Nels., and *L. subumbellata* Rollins, than with the mat forming *L. confluens* or even *L. hitchcockii*. In the field *L. tumulosa* is restricted to only a few white shale knolls on a flat west of Kodachrome Flat. I did not find the species on any other similar slopes (which were rare themselves), and so the species is likely rather restricted in its distribution.

In summary past authors have tended to lump together four distinct and dissimilar geographically isolated forms of *Lesquerella* under a single specific name, *L. hitchcockii*. Recent studies in the field have shown that these four subspecies could better be recognized at the specific level as they differ in ecology, distribution, and several vegetative features. Two of the taxa, *L. hitchcockii* and

*L. rubicundula* seem to be the basic elements in the evolution of the group, with *L. confluens* more closely related to *L. hitchcockii* and *L. tumulosa* closer to *L. rubicundula* than the two extremes are to each other.

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